UNIVERSITY OF MEDICINE AND PHARMACY
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NEUROBIOLOGY OF THE DOPING PHENOMENON AND PSYCHOLOGICAL INTERVENTION IN ELITE ATHLETES

SUMMARY

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Introduction

Doping: Background and Consequences Among Athletes

From a pharmacological perspective, doping involves the unauthorized use of certain substances or the application of prohibited methods (such as blood transfusions) to enhance performance, particularly by increasing strength and endurance (Detlief & Hemmersbach, 2010). Despite its recurrence among elite athletes and its negative effects on mental functioning, no psychological intervention has been developed to address the negative psychological impacts of doping on athletes to date. Since prevention is not always effective, addressing the consequences is equally important to prevent the chronicization of psychological difficulties faced by athletes due to doping and to facilitate their return to sports activity.

The causes that determine or, conversely, prevent an elite athlete from resorting to doping are complex and intersect social (e.g., pressure from the public, coaches, the athlete's social network), psychological (e.g., stress, anxiety, low self-esteem, personality traits such as perfectionism or need for approval), and physical factors (e.g., increased endurance, muscle mass development) (Anshel, 2015). According to the life cycle model, there are three categories of factors that increase the risk of doping and involve the doping cycle: personality traits (self-esteem, perfectionism, morality, etc.), systemic factors (anti-doping policies, the sporting environment in which the athlete operates), and contextual factors (access to and availability of doping substances, peer influence).

Various substances or drugs can negatively impact cognitive abilities. Research from different scientific fields highlights this aspect. For instance, in a visual-spatial cognitive task, steroid users performed worse than non-users (Kaufman et al., 2015). Studies indicate that long-term use of steroids leads to changes in the amygdala's structure, reduced resting state of the amygdala, and the emergence of neurochemical abnormalities (Kaufman et al., 2015).

Anabolic androgenic steroids can affect performance in the Morris water maze test, which targets spatial learning and memory (Magnusson et al., 2009; Novaes Gomes et al., 2014; Pieretti et al., 2013; Tanehkar et al., 2013). Additionally, they lead to impairments in inhibitory control and attention (Hildebrandt et al., 2014). Some studies have shown that long-term steroid use can also affect working memory (Kanayama et al., 2012).

Existing studies also support a negative effect of substances or drugs on emotional control. There is a relationship between performance-enhancing substances and aggression in athletes

(Sharifi et al., 2015; Colița et al., 2022). Studies have indicated that anabolic androgenic steroids are associated with a wide range of symptoms, including aggression, violence, and impulsive behaviors (Trenton & Currier, 2005).

Effects such as anxiety, impulsivity, marked irritability, and aggression typically manifest after prolonged use of steroids (Hall & Chapman, 2005; Pagonis et al., 2006; Pope et al., 2000; Trenton & Currier, 2005).

Psychotherapeutic Interventions in Sports: The Role of Cognitive-Behavioral Therapy and Self-Compassion in Managing the Consequences of Doping

Cognitive-behavioral therapy (CBT; Beck, 1993) is an evidence-based, structured, short-term, present-focused psychotherapeutic approach. It is currently the psychotherapeutic approach with the most robust empirical support, with numerous studies attesting to its effectiveness in treating mental disorders, as well as in non-clinical contexts (counseling, personal development, etc.).

In cognitive-behavioral conceptualization, it is not the situations or events themselves that trigger the observed emotional, behavioral, physiological, and cognitive reactions but rather the way the person thinks about/perceives the situation. Therefore, the therapeutic approach aims to identify and restructure irrational or dysfunctional cognitions (replacing them with rational/functional cognitions), which in turn leads to replacing the person's reactions with functional ones (Kennerly et al., 2017).

The behavioral component of cognitive-behavioral intervention is based on the antecedents and consequences of behaviors as determining or maintaining factors. Thus, to modify or stop counterproductive behaviors, the antecedents or consequences (e.g., rewards, benefits) of the targeted behavior will be altered.

Behavioral intervention can be used, on one hand, for cognitive restructuring (through behavioral experiments), and on the other hand, for problem-solving, behavioral activation (a key technique in depressive states), encouraging abstinence from doping substances (especially since some of them have a high potential for addiction), and self-regulation of behavior (e.g., for impulse control in cases where consumed substances amplify aggressive tendencies) (Beck & Beck, 2011).

Compassion-focused therapy aims to address particularly the emotional consequences of doping (depressive and anxious states), as well as personality traits that can influence doping substance use (low self-esteem, dysfunctional perfectionism, etc.).

Compassion-focused therapy was developed by Gilbert (2009) as a transdiagnostic therapeutic approach (addressing transdiagnostic risk and protective factors as mechanisms of change), integrated into cognitive-behavioral therapies, but incorporating concepts from other fields, such as developmental psychology, social psychology, or neuroscience.

The main goal of compassion-focused therapy is to reduce feelings of shame that may underlie various affective/dispositional syndromes (depressive states, anxiety) and to promote a positive attitude towards oneself and others, characterized by tolerance, warmth, and acceptance.

Regarding the usefulness of cognitive-behavioral therapy in sports, studies have shown that it can improve counterproductive perfectionism (Gustafsson & Lundqvist, 2016), attention difficulties (one of the common cognitive consequences of doping) (Meyers & Schleser, 1980), reduce stress and injuries (Perna et al., 2003), facilitate recovery from injuries (Coronado et al., 2020), reduce depressive symptoms and increase resilience (Gabana, 2017).

These results support the potential of cognitive-behavioral therapy to improve the symptomatology associated with doping substance use and to address its antecedents.

Several studies support the effectiveness of self-compassion interventions for athletes. Mosewich et al. (2013) showed that female athletes who benefited from a self-compassion intervention were less self-critical, ruminated less, and worried less about mistakes they made.

Several authors suggest that self-compassion is an important resource for athletes not only psychologically but also for their performance, having the potential to reduce anxiety-induced performance blocks and depressive states that may arise from poor performance, fatigue, or pressure.

Reis et al. (2019) showed that high self-compassion in athletes is positively associated with high well-being, perseverance, and responsible attitudes in response to a hypothetical difficult situation in sports, and negatively associated with fear of failure, fear of negative evaluation, rumination, self-criticism, fear of self-compassion, as well as counterproductive reactions (rumination, passivity, and self-criticism) to a difficult situation in sports.

Furthermore, results obtained by Ceccarelli et al. (2019) indicated that self-compassion can facilitate psychological recovery following a sports performance failure by promoting functional behavioral, cognitive, and emotional responses.

Thus, the results regarding self-compassion in athletes support its utility in reducing negative dispositional states (depressive states, anxiety) that may arise from doping, as well as in

addressing factors that may lead to dysfunctional behavioral responses (such as substance use), such as perfectionism and excessive self-criticism.

Although promising, this line of research is relatively recent, and most available results come from correlational or methodologically insufficiently rigorous experimental studies. Moreover, none of these studies investigate the role of self-compassion in reducing affective states and cognitive patterns resulting from doping.

Objectives and hypotheses

This study aims to address the lack of evidence-based therapeutic interventions for performance athletes affected by doping substance use. Consequently, this intervention proposes a comprehensive approach to doping, focusing not only on reducing doping behavior but also on mitigating its consequences, which often act as maintaining factors for the doping behavior itself.

The objectives of this study are: (1) to propose an evidence-based intervention protocol for reducing the cognitive-affective consequences of doping in athletes, (2) to test the proposed intervention on a sample of performance athletes affected by doping substance use, and (3) to test the psychometric properties of a scale that captures the well-being of athletes.

In the hypothesis, we expect that by the end of the intervention, the level of cognitive-affective symptomatology associated with doping in performance athletes and doping behavior will be significantly reduced compared to their initial levels.

Methodology

The psychological intervention was tested on a sample of 31 athletes practicing various sports either as amateurs or professionals (athletics, weightlifting, kayaking, Greco-Roman wrestling). They were members of sports clubs in Romania. Participants in the intervention were either suspected of doping or confirmed to have used doping substances. Due to the sensitivity of doping-related data, no identifying information such as gender or age was collected from participants. Each participant was randomly assigned a 4-digit code. Ethical recommendations for research were adhered to. The following ethical considerations were taken into account: (1) the relationship with study participants was based on respect, trust, and honesty, (2) participants were not exposed to the risk of harm, (3) before enrolling in the study, participants were informed of the potential benefits of participating in the intervention, (4) participants' decisions to participate or not were not influenced in any way, (5) anonymity was ensured for all participants (participants completed the questionnaires at two time points using the unique 4-digit code).

To test the psychometric properties of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS; Tennant et al., 2007), a sample of 198 participants (performance athletes, amateur athletes, or former athletes) was used. The sample had a mean age of 27.15 years, with a standard deviation of 7.66. Of these, 151 (75.88%) were female and 47 (23.62%) were male. Females had a mean age of 26.73 years, with a standard deviation of 7.80, and males had a mean age of 28.49 years, with a standard deviation of 7.10. The questionnaire was printed and distributed in physical format to all athletes participating in the study. Subsequently, the data were entered into the SPSS statistical program and analyzed according to the research hypotheses. Participants were not asked to provide information that could reveal their identity. The characteristics of the sample are presented in Figures 1-4.

The psychological intervention was based on two central approaches in psychology: cognitive-behavioral therapy (CBT; Beck, 1993) and compassion-focused therapy (Gilbert, 2009). The cognitive-behavioral component of the intervention was based on the premise that the difficulties faced by athletes stem from dysfunctional thinking. In other words, it is not the situations or events themselves that trigger the observed emotional, behavioral, physiological, and cognitive reactions, but the way the person thinks about/perceives the situation. Thus, the intervention aimed to identify and restructure irrational or dysfunctional cognitions (replacing them with rational/functional cognitions) (Kennerly et al., 2017). The intervention targets cognitive schemas related to personal value and perfectionism (e.g., "I am useless." "I am worthless"). The behavioral component of the cognitive-behavioral intervention focuses on antecedents and consequences of behaviors as determining or maintaining factors. Compassion-focused therapy aims to reduce feelings of shame that may underlie various affective/dispositional syndromes (depressive states, anxiety) and to promote a positive attitude towards oneself and others, characterized by tolerance, warmth, and acceptance.

Participants completed the psychological tools used in the study before and after the intervention. Before starting the research, participants were informed of the possible benefits of the study and were assured of personal data protection. No data were collected to identify participants. Each participant was randomly assigned a unique 4-digit code, which was used to complete the questionnaires before and after the intervention to compare scores at the two measurement points. Before completing the instruments, participants were instructed on how to

fill them out. The 31 athletes were randomly divided into groups of 10 and participated once a week for five weeks in a 90-minute session with a psychologist who administered the intervention.

Although the proposed protocol included 12 sessions, due to existing constraints, only 5 sessions were conducted. The first session aimed to assess the athletes, provide psychoeducation, and establish therapeutic goals.

Psychological assessment involves identifying current symptomatology, evaluating doping behavior (types of substances used, quantity, frequency of use, purposes for use), assessing the social context (sports team, family context, social network), and the current state of well-being. The psychotherapist will provide psychoeducation from both a cognitive-behavioral perspective and a compassion-focused therapy perspective. Participants will be shown how the interaction between environmental factors, personality factors, and cognitive patterns influences their behaviors and emotions, as well as how motivational systems can contribute to the maintenance of both substance use and specific symptomatology (depression, anxiety, concentration difficulties) as a result of substance use. Finally, therapeutic goals will be established with the athlete, addressing both the consequences of doping and the cessation of substance use.

The following four sessions aim to achieve therapeutic goals through specific therapeutic techniques. During the sessions, improvements in emotional self-regulation strategies (using compassion-focused therapy techniques) and restructuring of dysfunctional cognitive patterns (primarily using cognitive-behavioral techniques) that maintain cognitive-affective symptomatology and doping behavior will be targeted. Together with the athletes, the therapist explores their dysfunctional cognitions and uses therapeutic techniques such as empirical, logical, pragmatic disputes, behavioral experiments, and exposure (Clark & Egan, 2018) to modify these cognitions and their consequences (negative emotional states, dysfunctional behaviors – including substance use behavior).

Additionally, self-monitoring (Persons, 2008) will be used as a cognitive restructuring technique in itself – for example, it helps to modify cognitive distortions related to the frequency of negative experiences, a common distortion in individuals with depressive and anxious states. It is also a useful tool for monitoring progress (e.g., dysfunctional cognitions, negative emotional states, etc.), an active and continuous engagement strategy for the client in the therapeutic process, both during and outside therapy sessions (Cohen et al., 2013). The program will also include compassion training (typically through imagery techniques, where the person is trained to visualize

life contexts in which they show compassion towards themselves and others) and, last but not least, the opportunity to learn self-compassion through a therapeutic relationship based on compassion and acceptance from the therapist. Relaxation and mindfulness exercises will also be used to address cognitive-affective consequences of doping (concentration difficulties, negative emotional states) as well as factors that may contribute to the maintenance of substance use behavior, such as anxiety, depression, tension, etc. In compassion-focused therapy, these strategies include breathing exercises, body scanning, progressive muscle relaxation, guided imagery (including imagery specifically related to developing self-compassion), and mindfulness (Gilbert, 2010).

At the end of the four sessions, for relapse prevention (both regarding negative emotional states and dysfunctional cognitive patterns), the athlete will be taught to recognize signs of relapse and develop an action plan to manage them. Integrating this information by the athlete is crucial, as the greatest chance of success for the intervention is during the early stages of the relapse process (Bennett et al., 2005).

General cognitive abilities were measured with Matrix Matching Tasks (Pluck, 2019). This instrument was developed at the Quito Brain and Behavior Lab at Universidad San Francisco de Quito, Ecuador, to be used freely in research concerning general intellectual functioning. The tool includes two tasks: one visual-spatial and one semantic. The test can be administered pencil-and-paper and scored manually. The tasks within the test are independent of the language used by the respondent, being cross-culturally valid.

The visual-spatial test includes 14 items increasing in difficulty, starting with a very easy item and ending with a very difficult one. All items must be administered. Participants are asked to analyze the top images and choose one from the bottom images to complete the pattern. The first item is an acclimatization item and is used as an example. The test administrator says, "Here we have a row of purple triangles, so in this example, we would choose number 4 because it is also a purple triangle and completes the pattern." Then the administrator moves to the test items. Respondents can take as much time as they need for each item, but usually, they provide an answer in less than a minute. The participant's task is to choose the correct option. The evaluator circles the option chosen by the respondent and scores it according to the answer key. The correct answer is marked in bold on the scoring sheet. Items 1 to 3 are generally answered correctly. Errors are more common in clinical groups. If an error occurs in these items, the respondent receives zero points, but the evaluator presents the correct answer. For items 4 to 14, errors are scored with 0,

but the respondent is not told they were wrong. Respondents are also not confirmed if they answered correctly.

The semantic test includes 14 items, and the administration method is similar to that of the visual-spatial test. There is no time limit for items, and after the first three items, respondents are not told if they answered correctly or incorrectly. Respondents are asked to evaluate the top row of images and choose an image from the bottom row to create a set of similar images. For the acclimatization item, the evaluator will say, "The balloon is red and the cherries are red, so if you choose the bus, there will be three red things, and this would be a correct answer because everything has something in common." Then the evaluator moves to items 1 to 3. If an error is made on these items, the examiner scores it with 0 and explains to the respondent why another answer was correct. After item 7, there is again an acclimatization item, this time with two images to be selected.

Psychological well-being was measured with The Warwick-Edinburgh Mental Well-being Scale (WEMWBS; Tennant et al., 2007). WEMWBS has 14 items that measure subjective well-being and psychological functioning. The score is calculated by summing all the items, which are answered on a Likert scale from 1 to 5. There are no reverse-scored items. The minimum score is 14, and the maximum score is 70.

Participation in the intervention was operationalized as a categorical variable of "pretest measurement" (coded as 1) and "posttest measurement" (coded as 2).

Results

Before the intervention, the 31 participants had scores in visual-spatial abilities ranging from a minimum of 7 to a maximum of 14, with a mean of 10.29 and a standard deviation of 2.15. In semantic abilities, scores ranged from a minimum of 7 to a maximum of 13, with a mean of 10.39 and a standard deviation of 1.50. For psychological well-being, scores ranged from a minimum of 21 to a maximum of 69, with a mean of 44.74 and a standard deviation of 15.59.

After the intervention, the 31 participants had scores in visual-spatial abilities ranging from a minimum of 7 to a maximum of 12, with a mean of 10.42 and a standard deviation of 1.36. In semantic abilities, scores ranged from a minimum of 8 to a maximum of 13, with a mean of 10.52 and a standard deviation of 1.21. For psychological well-being, scores ranged from a minimum of 26 to a maximum of 62, with a mean of 47.90 and a standard deviation of 10.10.

There were no significant differences between the two measurements for visual-spatial abilities ($t = -0.53$, $p = 0.60$, Cohen's $d = -0.09$) and semantic abilities ($t = -0.94$, $p = 0.35$, Cohen's $d = -0.17$). There were significant differences between the two measurements for psychological well-being ($t = -1.94$, $p = 0.03$, Cohen's $d = -0.34$).

Regarding the WEMWBS scale, for item 1 ("I felt optimistic about the future."), participants' responses ranged from 1 to 5, with a mean of 3.95 and a standard deviation of 0.94. For item 2 ("I felt that I was a useful person."), responses ranged from 1 to 5, with a mean of 4.19 and a standard deviation of 0.90. For item 3 ("I felt relaxed."), responses ranged from 1 to 5, with a mean of 3.51 and a standard deviation of 0.93. For item 4 ("I felt interested in other people."), responses ranged from 1 to 5, with a mean of 3.92 and a standard deviation of 0.98. For item 5 ("I had enough energy."), responses ranged from 1 to 5, with a mean of 3.82 and a standard deviation of 0.86. For item 6 ("I coped well with problems."), responses ranged from 1 to 5, with a mean of 3.82 and a standard deviation of 0.71. For item 7 ("I had clear thinking."), responses ranged from 1 to 5, with a mean of 4.19 and a standard deviation of 0.78. For item 8 ("I felt good about myself."), responses ranged from 1 to 5, with a mean of 4.08 and a standard deviation of 0.93.

For item 9 ("I felt close to other people."), responses ranged from 1 to 5, with a mean of 3.95 and a standard deviation of 0.89. For item 10 ("I felt confident in myself."), responses ranged from 1 to 5, with a mean of 4.19 and a standard deviation of 0.91. For item 11 ("I was able to make decisions by myself."), responses ranged from 2 to 5, with a mean of 4.31 and a standard deviation of 0.71. For item 12 ("I felt loved."), responses ranged from 1 to 5, with a mean of 3.81 and a standard deviation of 1.15. For item 13 ("I was interested in new things."), responses ranged from 2 to 5, with a mean of 4.41 and a standard deviation of 0.73. For item 14 ("I felt grateful."), responses ranged from 2 to 5, with a mean of 4.09 and a standard deviation of 0.97.

There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 2 ("I felt that I was a useful person.") with $r = 0.61$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 3 ("I felt relaxed.") with $r = 0.52$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 4 ("I felt interested in other people.") with $r = 0.35$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 5 ("I had enough energy.") with $r = 0.44$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 6 ("I coped well with problems.") with $r = 0.44$, $p < 0.001$. There was a positive

correlation between item 1 ("I felt optimistic about the future.") and item 7 ("I had clear thinking.") with $r = 0.44$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 8 ("I felt good about myself.") with $r = 0.53$, $p < 0.001$.

There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 9 ("I felt close to other people.") with $r = 0.38$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 10 ("I felt confident in myself.") with $r = 0.54$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 11 ("I was able to make decisions by myself.") with $r = 0.41$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 12 ("I felt loved.") with $r = 0.29$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 13 ("I was interested in new things.") with $r = 0.28$, $p < 0.001$. There was a positive correlation between item 1 ("I felt optimistic about the future.") and item 14 ("I felt grateful.") with $r = 0.36$, $p < 0.001$.

There were no gender differences regarding responses to item 1 ("I felt optimistic about the future."), $p = 0.61$, $d = -0.08$. There were no gender differences regarding responses to item 2 ("I felt that I was a useful person."), $p = 0.45$, $d = -0.12$. There were no gender differences regarding responses to item 3 ("I felt relaxed."), $p = 0.45$, $d = -0.12$. There were no gender differences regarding responses to item 4 ("I felt interested in other people."), $p = 0.54$, $d = 0.10$. There were no gender differences regarding responses to item 5 ("I had enough energy."), $p = 0.19$, $d = -0.21$. There were gender differences regarding responses to item 6 ("I coped well with problems."), $p = 0.03$, $d = 0.35$, with men reporting higher values. There were no gender differences regarding responses to item 7 ("I had clear thinking."), $p = 0.63$, $d = 0.07$. There were no gender differences regarding responses to item 8 ("I felt good about myself."), $p = 0.88$, $d = -0.02$. There were no gender differences regarding responses to item 9 ("I felt close to other people."), $p = 0.38$, $d = -0.14$. There were no gender differences regarding responses to item 10 ("I felt confident in myself."), $p = 0.71$, $d = -0.06$. There were no gender differences regarding responses to item 11 ("I was able to make decisions by myself."), $p = 0.41$, $d = 0.13$. There were no gender differences regarding responses to item 12 ("I felt loved."), $p = 0.29$, $d = -0.17$. There were no gender differences regarding responses to item 13 ("I was interested in new things."), $p = 0.18$, $d = 0.22$. There were no gender differences regarding responses to item 14 ("I felt grateful."), $p = 0.48$, $d = -0.11$.

The factorial structure of the Warwick-Edinburgh Mental Well-being Scale was analyzed. According to initial studies examining the psychometric properties of the English version, all items are considered to measure a single factor. Therefore, this research tested a model where all items load onto a single factor. This approach addresses a limitation of previous studies where the scale's structure was not analyzed using confirmatory factor analysis.

The data indicated that item 1 has a factor loading of 0.639, item 2 has a factor loading of 0.649, item 3 has a factor loading of 0.596, item 4 has a factor loading of 0.499, item 5 has a factor loading of 0.573, item 6 has a factor loading of 0.479, item 7 has a factor loading of 0.501, item 8 has a factor loading of 0.719, item 9 has a factor loading of 0.534, item 10 has a factor loading of 0.701, item 11 has a factor loading of 0.449, item 12 has a factor loading of 0.542, item 13 has a factor loading of 0.353, and item 14 has a factor loading of 0.496.

According to confirmatory factor analysis, the measurement model did not fit the collected data ($\chi^2 = 272.24$, df = 77, CFI = 0.84, TLI = 0.81, RMSEA = 0.11, SRMR = 0.07). This is most likely due to the fact that the items address too differentiated aspects of well-being.

Network analysis was used to evaluate the interaction between items of the Warwick-Edinburgh Mental Well-being Scale and to identify central items within the scale's item network. The network was estimated using JASP 0.11.0.1.0 (JASP Team, 2019) with 500 bootstrap iterations, using least absolute shrinkage and an Extended Bayesian Information Criterion (EBICglasso) selection operator. The λ parameter was 0.50. Figure 12 provides a visual representation of the links between items. Figure 13 shows the centrality indicators: degree (the sum of direct connections of a node), closeness (the average distance between a node and all other nodes in the network), and betweenness (how often a node is situated on the shortest path between other nodes) (Bringmann et al., 2019). The items with the highest degree were item 13 ("I was interested in new things.") and item 3 ("I felt relaxed."). Both item 13 and item 3 also had the highest closeness. Finally, the items with the highest betweenness were item 13 and item 3.

According to the results, the strongest links are between item 5 ("I had enough energy.") and item 6 ("I coped well with problems."), between item 8 ("I felt good about myself.") and item 10 ("I felt confident in myself."), between item 1 ("I felt optimistic about the future.") and item 2 ("I felt that I was a useful person."), and between item 4 ("I felt interested in other people.") and item 9 ("I felt close to other people."). As expected based on confirmatory factor analysis, the items do not seem to cluster into a single general factor that encompasses the theoretical construct. For

example, items 4 and 9 appear to measure aspects related to the social dimension of well-being, while items 8 and 9 seem to refer to aspects related to self-perception. Additionally, item 12 ("I felt loved.") appears to be somewhat distanced in content from the rest of the scale.

The scale had good internal consistency, with Cronbach's $\alpha = 0.899$.

Discussion

The present studies had two main objectives: exploring the effectiveness of a psychological intervention on the cognitive and affective consequences of doping in athletes, and testing the psychometric properties of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS).

The psychological intervention was based on existing literature and included elements specific to two types of therapy: cognitive-behavioral therapy and compassion-focused therapy. According to the results, there were no significant differences between the two measurements for visual-spatial abilities and semantic abilities. These results align with previous studies suggesting that general cognitive abilities (which include both visual-spatial and semantic components) cannot be enhanced through psychological interventions. Additionally, previous research has not identified an impact on cognitive abilities from therapeutic interventions, regardless of their nature, including cognitive-behavioral therapy and emotion-focused therapy. Therefore, activities aimed at improving cognitive abilities in athletes do not represent a credible solution for practitioners in the field and should be avoided. The results indicated that participants had higher well-being scores after the intervention. This observation is consistent with previous studies related to the effects of therapies on well-being. Both cognitive-behavioral therapy and rational-emotive therapy have significant effects on well-being, according to existing meta-analytic data in the literature.

Finally, the WEMWBS scale showed high, statistically significant correlations between its items, but according to confirmatory factor analysis, the items of the WEMWBS do not cluster into a single general factor that encompasses the theoretical construct. A network analysis was used to explore the reasons why confirmatory factor analysis does not support a single factor for the scale. According to the results, the strongest links are between item 5 ("I had enough energy.") and item 6 ("I coped well with problems."), between item 8 ("I felt good about myself.") and item 10 ("I felt confident in myself."), between item 1 ("I felt optimistic about the future.") and item 2 ("I felt that I was a useful person."), and between item 4 ("I felt interested in other people.") and item 9 ("I felt close to other people."). As expected based on the confirmatory factor analysis, the items do not seem to cluster into a single general factor that encompasses the theoretical construct.

For example, items 4 and 9 seem to measure aspects related to the social dimension of well-being, while items 8 and 9 appear to refer to aspects related to self-perception. Additionally, item 12 ("I felt loved.") seems to be somewhat distanced in content from the rest of the scale. Although the scale can be used to measure well-being, the items target aspects that are too different from each other to consider that the instrument measures a single general construct.

This study has both theoretical and practical contributions. First, it confirms what has been highlighted in previous research regarding the enhancement of cognitive abilities in athletes. The results indicate that the general cognitive abilities of athletes cannot be increased through cognitive-behavioral or compassion-based interventions. Second, the study highlights that psychological interventions based on cognitive-behavioral therapy and compassion-focused therapy can improve the psychological well-being of athletes. These results support existing conclusions in research conducted in other countries regarding methods for enhancing athletes' well-being. Practically, the study's results are relevant for sports psychology practitioners as they provide additional evidence for using cognitive-behavioral therapy and compassion-focused therapy with athletes who are suspected or confirmed of doping. Practically, these findings support the use of specific therapeutic methods by sports psychologists, including identifying and restructuring irrational or dysfunctional cognitions (replacing them with rational/functional cognitions) (Kennerly et al., 2017), identifying factors that trigger or maintain negative behaviors, reducing feelings of shame that may underpin various affective/dispositional syndromes (depressive states, anxiety), and promoting a positive attitude toward oneself and others, characterized by tolerance, warmth, and acceptance.

The present study has several limitations that future research may address. First and foremost, it should be noted that the sample used to test the intervention was a convenience sample. Therefore, the results cannot be confidently generalized to the broader population of athletes. Additionally, in order to protect participants' confidentiality, no data were collected regarding their age, gender, or the type of sport they practiced. As a result, we cannot assess whether the sample was representative of the general population of Romanian athletes. Future studies may consider employing more diverse samples, including athletes of different ages, genders, and sports disciplines. This would allow researchers to examine whether the outcomes of such interventions can be replicated across various participant characteristics.

Secondly, the intervention tested in the present study combined two psychotherapeutic approaches: cognitive-behavioral therapy (CBT) and compassion-focused therapy (CFT). Due to the design of the intervention, it was not possible to isolate the specific effects of each therapeutic component. Consequently, we cannot determine whether the observed improvements in well-being were due to the CBT elements, the CFT elements, or their combination. Future research could employ a more complex design involving three distinct groups: one receiving only CBT techniques, another receiving only CFT techniques, and a third receiving a combination of both. Such a design would allow for direct comparisons between the groups and clarify whether a particular approach is more effective or whether the combination of both therapies yields the most beneficial results.

Another limitation concerns the measurement of well-being through self-report instruments. Although this is the most commonly used method in psychological well-being research, it is not without its limitations. Participants' responses may be influenced by their expectations regarding the effectiveness of the intervention. Even if the intervention had no actual impact, strong beliefs about its benefits could lead participants to report improved outcomes. Additionally, participants might respond in a socially desirable manner, aiming to please the psychologist conducting the intervention or providing answers they believe are expected of them. Future studies might include third-party reports (e.g., from close acquaintances) regarding participants' well-being to mitigate these biases.

A further limitation is the absence of a control group. Future research could incorporate a group of athletes who do not receive any psychological intervention. Comparing this group to those receiving the intervention would help rule out alternative explanations for the observed increase in well-being scores post-intervention. These alternative explanations may include the mere passage of time, natural developmental changes, or the influence of external events unrelated to the intervention (e.g., support from sports clubs, family, or friends). Including a control group would enhance the internal validity of the findings and provide a more robust test of the intervention's effectiveness.

Finally, the current study did not include a placebo group, which limits our ability to rule out expectancy effects. To address this issue, future studies could incorporate a placebo group receiving an inert intervention that nonetheless creates expectations of improved well-being. If no significant differences are found between participants receiving the actual psychological

intervention (CBT combined with CFT) and those in the placebo group, the effectiveness of the intervention may be called into question and attributed to participant expectations rather than the intervention itself.

Conclusions

Doping among professional and amateur athletes is a current research topic as statistics show that in 2015 alone, more than 1,900 athletes were sanctioned for doping, representing a 14% increase from the previous year. There are numerous factors that lead athletes to resort to doping. Primarily, the excessive desire to achieve high-level performance drives athletes to dope. Other significant factors include social influences, such as the pressure to win from family or friends, the example of other athletes who have doped, psychological factors like dysfunctional perfectionism, stress, anxiety, depression, personal problems, boredom, and physical factors such as weight loss, body mass development, increased endurance, muscle relaxation, and pain management.

This phenomenon is particularly problematic because various substances or drugs can negatively impact cognitive abilities. A range of research from different scientific fields highlights this aspect. For instance, in a visual-spatial cognitive task, steroid users performed worse than non-users (Kaufman et al., 2015). Studies indicate that long-term use of steroids leads to alterations in the structure of the amygdala, decreased resting state of the amygdala, and neurochemical anomalies (Kaufman et al., 2015). Anabolic-androgenic steroids can affect performance on the Morris water maze test, which assesses spatial learning and memory (Magnusson et al., 2009; Novaes Gomes et al., 2014; Pieretti et al., 2013; Tanehkar et al., 2013). Additionally, they lead to impairments in inhibitory control and attention (Hildebrandt et al., 2014). Some studies have also shown that long-term steroid use can affect working memory (Kanayama et al., 2012).

Existing research also supports a negative effect of substances or drugs on affective control. There is a relationship between the use of performance-enhancing substances and aggression in athletes (Sharifi et al., 2015). Studies have shown that anabolic-androgenic steroids are associated with a range of symptoms, including aggression, violence, and impulsive behaviors (Trenton & Currier, 2005). Effects such as anxiety, impulsivity, marked irritability, and aggression typically manifest after prolonged steroid use (Hall & Chapman, 2005; Pagonis et al., 2006; Pope et al., 2000; Trenton & Currier, 2005).

Given these negative effects on both cognitive and affective aspects of athletes, it is important to identify interventions with the greatest potential for improvement. A major limitation

in the literature is that most tested interventions to date focus on doping prevention (Barkoukis et al., 2016; Mazanov et al., 2011). In the current research, the intervention consisted of five sessions combining cognitive-behavioral methods with compassion-focused therapy techniques. The first session aimed to assess athletes, provide psychoeducation, and establish therapeutic goals. Psychological assessment involved identifying current symptoms, evaluating doping behavior (types of substances used, quantity, frequency of use, purpose of use), assessing the social context (team environment, family context, social network), and current well-being. The sessions presented how the interaction between environmental factors, personality traits, and cognitive patterns influences behaviors and emotions, as well as how our motivational systems can contribute to both the maintenance of doping behavior and the specific symptoms (depression, anxiety, concentration difficulties) resulting from substance use. Finally, therapeutic goals were set.

The next four sessions used specific therapeutic methods. Dysfunctional cognitions of athletes were explored, and therapeutic techniques such as empirical, logical, and pragmatic disputations, behavioral experiments, and exposure (Clark & Egan, 2018) were used to modify these cognitions and their consequences (negative emotional states, dysfunctional behaviors—including substance use). Furthermore, self-monitoring (Persons, 2008) was utilized to modify cognitive distortions regarding the frequency of negative experiences, monitor progress, and maintain active and continuous client engagement in the therapeutic process, both during and outside therapy sessions (Cohen et al., 2013). The intervention also included compassion-building methods (imagery techniques where the person is trained to visualize life contexts in which they show compassion toward themselves and others) and, importantly, the opportunity to learn self-compassion through a therapeutic relationship based on compassion and acceptance from the therapist. Relaxation and mindfulness exercises were also used to address the cognitive-affective consequences of doping (concentration difficulties, negative emotional states) and factors that may contribute to maintaining substance use behavior, such as anxiety, depression, tension, etc. (Gilbert, 2010). At the end of the four sessions, a relapse prevention plan was developed to manage relapses (both in terms of negative emotional states and dysfunctional cognitive patterns) (Bennett et al., 2005).

Participants completed the psychological instruments used in the study both before and after the intervention. Before starting the research, they were informed about the possible benefits

of the study and assured of the protection of their personal data. No data were collected about participants to ensure they could not be identified later. Each participant was randomly assigned a unique four-digit code, which was used to complete the questionnaires before and after the intervention, allowing comparison of scores between the two measurements over time. Before completing the instruments, participants were given instructions on how to fill them out. The 31 athletes were randomly divided into groups of 10 and participated once a week for five weeks in a 90-minute session with a psychologist administering the intervention.

According to the results, there were no significant differences between the two measurements for visual-spatial and semantic skills. These results are consistent with previous studies suggesting that general cognitive skills (which include both visual-spatial and semantic components) cannot be improved through psychological interventions. Furthermore, previous research has not identified an impact on cognitive skills from therapeutic interventions, regardless of their nature, including cognitive-behavioral therapy and emotion-focused therapy. Therefore, activities aimed at improving cognitive skills in athletes do not represent a credible solution for practitioners in the field and should be avoided. The results indicated that participants had higher well-being scores after the intervention. This observation is consistent with previous studies related to the effect of therapies on well-being. Both cognitive-behavioral therapy and rational-emotive therapy have significant effects on well-being, according to existing meta-analytic data in the literature.

The second major objective of the current studies was to test the psychometric properties of the WEMWBS. According to the results, the WEMWBS scale showed high, statistically significant correlations among its items, but according to confirmatory factor analysis, the items of the WEMWBS scale do not cluster into a single general factor encompassing the theoretical construct. A network analysis was used to examine the reasons why the scale does not present a single factor. The results indicated that the strongest links were between item 5 ("I had enough energy.") and item 6 ("I coped well with problems."), between item 8 ("I felt good about myself.") and item 10 ("I felt confident about myself."), between item 1 ("I felt optimistic about the future.") and item 2 ("I felt useful."), and between item 4 ("I felt interested in other people.") and item 9 ("I felt close to other people."). As expected based on confirmatory factor analysis, the items do not seem to group into a single general factor encompassing the theoretical construct. For example, items 4 and 9 seem to measure aspects related to the social dimension of well-being, while items

8 and 9 refer to aspects related to self-perception. Additionally, item 12 ("I felt loved.") appears to be content-wise distant from the rest of the scale. Although the scale can be used to measure well-being, the items target too diverse aspects to consider the tool as measuring a single general construct.

The study confirms what has been highlighted in previous research regarding the enhancement of cognitive skills in athletes. The results indicate that general cognitive skills of athletes cannot be increased through cognitive-behavioral or compassion-based interventions. Research highlights that psychological interventions based on cognitive-behavioral therapy and compassion-focused therapy can improve athletes' psychological well-being. These results support conclusions from research conducted in other countries regarding methods to enhance athletes' well-being. The study results are relevant for sports psychology practitioners as they provide additional evidence for using cognitive-behavioral therapy and compassion-focused therapy with athletes suspected or confirmed to be involved in doping. The current research supports the use of specific therapeutic methods by sports psychologists. These methods include identifying and restructuring irrational or dysfunctional cognitions (replacing them with rational/functional cognitions) (Kennerly et al., 2017), identifying factors that drive or maintain negative behaviors, reducing feelings of shame that may underlie various affective/dispositional syndromes (depressive states, anxiety), and promoting a positive attitude toward oneself and others, characterized by tolerance, warmth, and acceptance.

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